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## URBAN GAS CONSUMPTION IN THE USSR

The Fourth Five-Year Plan envisaged large-scale development in the USSR of a new branch of industry -- a gas industry based on extraction of natural gas and on processing of coal, peat, and shales. By 1950, the production of gas from coal and shales was to reach 1.9 billion cubic meters, and from natural gas, 8.4 billion cubic meters.

During the five postwar years new gas plants and long-distance gas pipelines between Saratov and Moscow, Dashava and Kiev, and Kokhtla-Yarve and Leningrad were built and put into operation.

The following table gives actual data on gas consumption for the daily living requirements of the population in one of the large cities of the USSR (per apartment in cubic meters under normal conditions when the calorific value of the gas is 3,600 kilogram-calories per cubic meter under normal conditions.

| | 1939 | 1949 | 1950 |
|---|---|---|---|
| January | 6.5 | 6.3 | 6.1 |
| February | 6.6 | 5.9 | 6.1 |
| March | 6.0 | 6.1 | 6.0 |
| April | 5.7 | 6.0 | 5.6 |
| May | 5.5 | 5.2 | 4.5 |
| June | 3.3 | 4.0 | 4.1 |
| July | 3.3 | 3.0 | 3.16 |

| | 1939 | 1949 | 1950 |
|---|---|---|---|
| August | 3.1 | 2.7 | 3.04 |
| September | 4.3 | 4.0 | 4.0 |
| October | 5.0 | 5.3 | 5.0 |
| November | 5.0 | 5.6 | 5.3 |
| December | 6.5 | 5.7 | 6.1 |
| Total | 60.8 | 59.8 | 59.00 |

In analyzing this data, it should be borne in mind that heating by stove predominates in the dwelling houses of this city; thus, considering the lower cost of gas in comparison with firewood, partial use of gas cooking ranges for heating is inevitable. This fact is reflected in the consumption of gas for daily living requirements during the winter months.

Exclusive of gas for heating, the amount of gas consumed in summer by the population, by enterprises, and by municipal buildings represents a one-third decrease from winter consumption. The decline in gas consumption in the summer is a result of the partial exodus of people from the city, the closing of schools, a rise in the outside temperature, and a change in menus in home and public dining establishments.

Urban gas requirements are determined on the basis of norms showing categories of consumers and the purposes for which they use gas heat.

In estimating gas consumption per person, both the structure of the urban economy, which differs from city to city, and the living conditions of the population must be taken into account. Climatic conditions, which vary greatly from region to region in the USSR, also affect the gas consumption norms.

Per capita data on over-all gas consumption in the large industrial centers cannot be applied to rayon centers and industrial workers' settlements.

The gas consumption norms which appear below are valid provided gas appliances are used for their primary purpose. If, in homes with stoves, gas ranges are also used to heat the rooms and the water heater is used to heat water for laundering purposes, then the gas consumption norms for cooking and hot water will naturally not be valid.

For the various categories of gas consumers, indexes must be established which take into account their particular requirements and yet lend themselves to computation of the city's over-all gas consumption.

The following indexes are suggested for determining the gas consumption norms of various categories of consumers.

1. Gas consumption norms for everyday requirements of the population:

   a. Cooking -- per person per year

   b. Hot water -- per person per year

2. Gas consumption norm for heating of buildings -- per cubic meter of space based on external dimensions of building

3. Gas consumption norm for public dining enterprises -- per dish

4. Gas consumption norm for washing clothes in laundries -- per kilogram of dry clothes

5. Gas consumption norm in children's institutions -- per child per year

6. Gas consumption norms for schools, educational institutions of the Ministry of Labor Reserves, tekhnikums, and universities -- per student per year

7. Gas consumption norms for hospitals:

   a. Mobile type -- per visit

   b. Stationary type -- per bed per year

8. Gas consumption norm for baths -- per bath

9. Gas consumption norm for bakeries, candy factories, and other enterprises of the food industry -- per ton of output per year

Cities are supplied with gases of varying chemical elements and calorific value; therefore, the gas consumption norms presented below are expressed, not in cubic meters, but in kilogram-calories. These may be converted to cubic meters by dividing them by the calorific value of one cubic meter of the gas under normal conditions.

For estimating gas consumption for hot water, irrespective of the gas appliances with which apartments are equipped, a norm of 0.24 megacalorie per resident per year is suggested. In cities where there is no central hot water system and the number of people who live in apartments with baths amounts to about 20 percent of the total city population, the average norm of gas heat consumption per inhabitant is 0.37 megacalorie per person.

For heating and ventilation, annual gas-heat consumption is determined according to the number of low-temperature days per month.

For public laundries the following gas-heat consumption norms per kilogram of dry laundry are suggested (in kilogram-calories): for hand laundries, 2,000; for hand laundries with drying racks, 2,800; and for mechanized laundries, 4,200.

The total laundry per inhabitant per year can be considered to be 75-100 kilograms.

For estimating gas consumption by public dining enterprises a reliable norm is 400 kilogram-calories per dish or 300,000 kilogram-calories per year for each person who eats at the enterprise. The number of people who eat at public dining enterprises may be considered to be 20-30 percent of the total population.

Allowing for daily needs and laboratory requirements, gas-heat consumption in schools may be considered to be 240,000 kilogram-calories per year per pupil.

In educational institutions of the Ministry of Labor Reserves, gas consumption per pupil (not including student workshops and heating of the buildings) is approximately 2,400 kilogram-calories per day or 720,000 per year.

Gas-heat consumption for cooking and daily living requirements in higher and secondary schools can be considered to be 2,000 kilogram-calories per day or 570,000 per year per student.

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Gas-heat consumption per bed in stationary hospitals is shown below (in kilogram-calories per year):

| | |
|---|---|
| Cooking | 1,000,000 |
| Hot water | 1,680,000 |
| Laundry | 2,020,000 |
| Other needs | 400,000 |
| Total | 5,200,000 |

For purposes of estimating, the number of beds per 1,000 city inhabitants may be considered to be 8-9 in hospitals and 1-1.5 in maternity homes.

For consolidated estimates, the following norms of gas-heat consumption by bakeries and candy factories are suggested (per ton of output): breads, 450,000-500,000 kilogram-calories; candies, 1-1.2 million kilogram-calories.

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